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ABSTRACT

The way that higher education planners can take into account changes in the post-industrial society is discussed. The scenario method is proposed as a method of integrating futures information. The planner can be provided with several probable futures, each of which can be incorporated in a scenario. An effective scenario provides the planner relevant trends and events that will be helpful in developing a plan. In addition to determining what data are relevant to planning, the scenario developer needs to clarify the following issues: the number of scenarios needed, the time horizon of the scenarios, the probable use of the scenarios, and those who will use the scenarios. Trends important to higher education scenario developers include: the change in the nature of occupations, the change in attitudes toward work, and the declining amount of time the future American will spend working. Six important trends that will affect education in the future include: computers, new delivery media, statistical analysis, social change, institutional inventions, and the use of videotapes to record the lectures of outstanding instructors. It is recommended that scenarios be developed for the future funding of higher education. (SW)

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INTEGRATING FUTURE INFORMATION THROUGH SCENARIOS

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Elizabeth F. Fox, Chair
Forum Publications Editorial
Advisory Committee

INTEGRATING FUTURE INFORMATION THROUGH SCENARIOS

The Coming of Post-Industrial Society

In times of economic and social tranquility, understanding the future is easy. Most observers can reliably expect that tomorrow will be very like today. In times of turbulence and rapid change, the future is less easily discerned. Since Western, and especially North American, society appears to be currently in a period of turbulent, rapid change, this paper will propose ways of thinking about the current future. It will do so by suggesting the scenario method for integrating the many and frequently contradictory signals we receive about the manner in which the future is unfolding.

In the field of higher education, the future is especially obscure. For the forty years since the end of the Second World War, higher education experienced constant growth within the traditional pattern of the four-year college or university. As a consequence, physical plants were expanded, new facilities built, and new faculties trained and tenured. At the same time, new experiments were initiated: the two-year community colleges flowered; vocational and evening programs flourished; and adult education became an established feature of American society. The reasons for that growth and those changes--the returning veterans and the G.I. Bill, the post-war Baby Boom phenomenon, and U.S. economic growth--are so well documented elsewhere that they will not be further addressed here.

For the last decade, U.S. society has been undergoing another, and perhaps more fundamental, change than in the post-war period. The nation is moving from its industrial phase to the widely-advertised post-industrial phase. That transition, which has its own prophets and literature, has been succinctly anticipated in Daniel

Bell's seminal 1973 work The Coming of Post-Industrial Society.[1] In that book, Professor Bell set forth the ways in which technology, including intellectual technology, and the codification of theoretical knowledge as a new principle for innovation and policy, were reshaping the techno-economic order and with it, the organization of society as well. The changes Professor Bell addressed are now unfolding before us.

The consequences of those changes are substantial. The current transition is only the second great change in American society. The first was the transformation of the nation, after the Civil War, from a rural, agricultural, insular nation to an urban, industrial world power. Those changes occurred in part because of such political forces as the Civil War and the two World Wars, but also because of the introduction of the steam engine and the associated technological changes of the Industrial Revolution.

The current change, from industrial to post-industrial, is likely to be equally consequential. It is not, however, the purpose of this paper to anticipate what the post-industrial future will be. Instead, the paper will discuss how higher education planners can identify signals of those changes and bring them in manageable form into the planning process. The mechanism for doing so is the scenario method, a technique originated in military planning which has over the last several decades been widely adopted by industrial planners in Europe and North America.

The Nature of Scenarios

An extensive literature dealing with scenario preparation and usage already exists in the business literature.[2] Confronted with the kinds of uncertainty faced by business planners, planners in higher education are also beginning to consider the use

of scenarios.[3] As is pointed out in the references cited, the word scenario comes from the dramatic arts. In the theatre, it is an outline of the plot; in motion pictures, a scenario sets forth the sequence of action, descriptions of characters and scenes, and other details relevant to the plot, without reproducing the actual script.

In the planner's vocabulary, the scenario is a way for organizing available information about the future in an operationally useful manner.[4] The scenario method is thus not in itself futures research. It is instead a method for utilizing the products of various futures research methods by integrating them into a form useful to the decision-maker. The late great futures researcher Herman Kahn has pointed out that scenarios are not forecasts;[5] they may, however, include the products of forecasts, as well as of such other futures techniques as Delphi studies, cross impact analyses and other "hard" and "soft" methods.

We know that there is only one "real future." Unfortunately, we do not know which one, of all possible futures, the "real future" will be. Since it is nevertheless necessary to plan, some way must be given the planner to enable him to think about the future. Accordingly, to bring uncertainty into the planning process in a manageable way, the planner can be provided with several "probable" futures. Each of such futures may be incorporated in a scenario, which incorporates the elements of that future. Thus, an effective scenario is one which presents to the planner relevant trends and events that will assist him in the development of his plan. It is the role of the scenario draftsman to capture those trends and events, and to weave them skillfully into the tapestry that becomes the scenario.

The idea of scenarios for higher education is far from novel. In the 1973 report The Future of Higher Education, Alexander Mood introduced the study by saying

We cannot think cogently about the future of higher education without first considering the context in which it operates and which shape it very powerfully. Hence, we must begin by thinking about society at large and what it might become in the future. There is little doubt that it is changing and vast uncertainty about what it is changing to. To put it another way, one can identify numerous trends and undercurrents which, if they persist, would bring about radical changes in society, but which ones are going to persist and which ones are going to fade away? There is, of course, no way to tell; we must rely mainly on our judgments of what the probabilities are and bet or hedge accordingly.

In this situation, the cautious or scholarly course would be to select several apparently strong trends and develop several rather different models of the future based on various consistent combinations of those trends.[6]

Dr. Mood went on to develop a future which he saw as a desirable one. But not all futures are going to be desirable, and the planner must take into consideration unfavorable futures as well as favorable ones.

Central to the task of doing so is the selection of relevant data about the future. In the last several decades, the amount of information about the future has become extensive. A vast literature has emerged whose purpose is to illuminate the economic, political, social, technological and environmental aspects of the future. If anything, the planner has too much information about the next several decades, much of it incomplete, contradictory and not especially plausible. From this rich store, the task of the scenario draftsman is to determine what data are relevant to

his planning process, and to employ those data in his scenarios in a useful manner.

One example of how to do so will suffice. Basic to the higher education planning process is the demographic composition of American society over the forecast period. Projections of population data are made by the U.S. Bureau of the Census through the first quarter of the twenty-first century. Those projections are available for several sets of premises about fertility, mortality and migration. Illustrative data are set forth in the following table.

Table I

Projections of Total Population, 1983-2025 (in thousands)[7]

Year	Lowest Series	Middle Series	Highest Series	Zero Migration Series
1983	233,675	234,193	234,940	233,283
1990	245,507	249,731	254,686	245,310
2000	255,638	267,990	282,339	257,854
2025	259,673	301,022	356,601	274,394

Data on the age and sex composition, the geographical distribution, and the racial mix of these projections are provided by the Census Bureau. From these data, the planner may develop scenarios which incorporate the particular demographic make-up of his market.

Other similar information about the future is readily available from public agencies, private research organizations, and universities. A periodical literature exists which is represented by such journals as American Demographics, Futures and Long Range Planning. The problem for the scenario draftsman is not the acquisition

of useful information, but the selection of useful information from the many sources available.

Scenario development is essentially a process in which elements relevant to the purpose of the scenario are abstracted from the total environment. While in the real world all variables may impinge on decision-making, scenarios are too limited to encompass all possible variables. Thus, only the most relevant should be chosen. Because higher education has a broad set of purposes and is influenced by many different aspects of society, care must be exercised in selecting those elements whose effects are most critical to the processes and institutions of higher education. It is therefore desirable at the outset of the scenario development process to indentify and list those elements. Other questions to be answered at the same stage are:

- How many scenarios will be developed?
- What is the time horizon of those scenarios?
- How will the scenarios be used, and
- Who will use them?

All of these factors determine the nature, content and utility of planning scenarios.

Changes in Society

In order to consider potential futures for higher education, it is necessary to address the mission of higher education in our society. It is probably fair to say that the objective of higher education is to prepare its graduates to function effectively in society. In the Carnegie Commission report cited earlier, Professor Mood lists what students want from higher education. These wants are three:

- Some kind of guarantee of employability at a respectable job if they faithfully fulfill the requirements for a degree;
- An understanding of how the world operates so that they will be able to deal successfully with the world; and
- An interesting and personally fulfilling college experience in which they can make valued friendships and participate in rewarding social activities.[8]

In short, they wish to be prepared to function effectively in the present American society.

What is the nature of that society? It is one which, most observers agree, is in the midst of extensive fundamental change. As Daniel Bell has pointed out, the United States is in the process of shifting from an industrial to a post-industrial society.[9] Indeed, he has argued that much of the character of men and the pattern of their social relations is shaped by the kind of work they do. By taking work as a principle which divides the modalities of character, he speaks of pre-industrial, industrial, and post-industrial work. A post-industrial society is one which centers on services--human services, professional and technical services.

In a 1976 work, Professor Bell pointed out that

> The post-industrial society centers on the technology, the kind of work people do (though there are political implications in the relative decline of the working class) and the organization of knowledge.[10]

Herman Kahn and his co-workers at the Hudson Institute have described the new society as one of economic growth and increasing human well-being.[11] It is

therefore appropriate to examine whether the current state of American society is predominantly industrial or post-industrial.

In his best-selling Megatrends, an examination of trends in U.S. society, John Naisbitt describes how far this country has moved in the post-industrial direction:

> The real increase [in employment] has been in information occupations. In 1950, only about 17 percent of us worked in information jobs. Now more than 60 percent of us work with information as programmers, teachers, clerks, secretaries, accountants, stockbrokers, managers, insurance people, bureaucrats, lawyers, bankers and technicians. And many more workers hold information jobs within manufacturing companies. Most Americans spend their time creating, processing, or distributing information. For example, workers in banking, the stock market and insurance all hold information jobs. David L. Birch of MIT reports that only 13 percent of our labor force is engaged in manufacturing operations today.[12]

This analysis suggests that work in America is undergoing an important transition. We are ceasing to make things and increasingly handling abstractions.

Not only is the nature of work in America changing, but attitudes toward work are changing as well. Nowhere is that better expressed than in Daniel Yankelovich's writings. Mr. Yankelovich reports that the traditional American work objective of "success" is rapidly being replaced by the drive toward self-fulfillment.[13]

No discussion of work in American society would be complete without recognition of the diminishing role work plays in American life. During the century,

the time Americans spend at work has been cut almost in half. In 1890, the average work week for a manufacturing worker was 60 hours;[14] by 1982, that work week had shrunk to 38.9 hours.[15] Since the Second World War, the average work week for all non-agricultural workers has dropped from 39.8 hours in 1950[16] to 34.8 hours in 1982.[17] These figures, of course, reflect the increase in productivity and efficiency achieved through increases in capital investment in all areas of American production, and show a fairly consistent downward trend.

A dramatic discontinuity is about to occur in that trend, the discontinuity caused both by office automation and the sudden increase in robotization of production, sometimes called computer-assisted manufacturing. The consequence of the introduction of computers into the business office and the manufacturing plant will be to reduce the numbers of employees required to conduct traditional business and manufacturing operations. One probable effect will be to reduce the length of the work week even faster than it has heretofore been dropping.

The scenario draftsman dealing with social variables and their effect on higher education with therefore have three major new factors with which to deal:

- the change in the nature of occupations,
- the change in the attitudes toward work and its place in life; and
- the declining amount of time the future Americans will spend engaged in work.

These must inevitably be issues with which the planners of higher education and its institutions must deal.

Change in Higher Education

In Learning for Tomorrow,[18] Harold Shane and June Shane urge that we create an educational program that carries us

From	To
Mass Teaching	Personalized Teaching
Single Learnings	Multiple Learnings
Passive Answer-absorbing	Active Answer-seeking
Rigid Daily Programs	Flexible Schedules
Training in formal skills and knowledge	Building desirable attitudes and appreciations that stimulate a questing for knowledge
Teacher initiative and direction	Student initiative and group planning
Isolated content	Interrelated content
Memorized answers	Problem awareness
Emphasis on textbooks	Use of media in addition to textbooks
Passive mastery of information	Active stimulation of intellect

If those are indeed the objectives of the educational system of the future, what are the forces that will propel us toward them?

It is evident that the nature of American education is changing in important ways. Education is increasingly being perceived as something to be experienced all through one's life, not merely through childhood and adolescence. Accordingly, the classrooms of the high schools and colleges of this country are filled night and day with pupils ranging in age from children and young people to mid-career and retired adults. Equally important is the growing recognition that the adult learns in ways different from the ways children learn, and requires curricula different from the traditional curricula offered the young. These changes alone are affecting the content of the educational process and the training of faculty.

Just as significant are changes in the techniques of education, by which the

nature of the educational process itself is being transformed. One responsible consulting organization has identified six important new trends that will make education in the future different from that of the past.[19] Those trends are:

- Computers

Computers are increasingly being employed in administration, teaching and learning. While most current computer-based systems focus on drill and review, the use of intelligent programs will lead to self-discovery modes and "real-life" simulations that will permit students to learn from computer-based experiences.

In 1984, there were about a million general-purpose microcomputers in schools, many of which were principally used as computerized page-turners and drill sergeants. But students, faculty and administrators are beginning to view the computer less as a computing machine and more as a broadly applicable tool for education and communication. Moreover, computers are accessible over a twenty-four hour day in ways flesh-and-blood faculty are not.

A recent study of fifteen colleges and universities by BYTE magazine revealed the innovative ways institutions in the forefront of computer utilization are integrating personal computers into the educational process. For example, by 1986, if all goes as planned, all freshman at Carnegie-Mellon University will be required to buy a very powerful personal computer that will become an integral part of their education. The Massachusetts Institute of Technology has established a $70 million joint research and development project with IBM and DEC. One of the goals of the project is

to make hardware obstacles transparent to the user, so that a program produced on one part of the system is available to all other users. The entire university will rely on a single operating system and a comprehensive network. Other universities studied have differing and equally imaginative approaches to the absorption of computer technology into the higher education process.[20]

Two forces that cannot be overlooked are the rapidly rising power of microcomputers and the declining cost of computer power. These trends will increase the availability of desk-top and portable computers to universities, faculties and students. One factor that deserves mention is the recognition of the educational impact of the microcomputer by computer manufacturers. Such firms as IBM, DEC and Apple have been extremely supportive of university efforts to acquire equipment and have made machines available on very attractive financial terms to students and faculty, accelerating the introduction of microcomputers into the educational process.

- **New Delivery Media**

The traditional modes of delivering education have been augmented by such devices as cable television; teletext, videotext and video disc systems; direct broadcast satellites; the electronic blackboard; and remote conferencing. All of these systems can provide electronic networks for delivery of education and provide information quickly and inexpensively anywhere within the system. For example, through satellite broadcasts, it is possible for one lecturer to address and interact with classrooms all over the country.

- **Statistical Analysis**

Through the use of epidemiological techniques in education, effective methods may be rapidly identified and improved. New means are emerging for quickly analyzing educational policies to determine whether or not they are producing their intended results. Accessibility to computers and communication systems enormously accelerates the acquisition, analysis and dissemination of the appropriate data.

- **Social Change**

The student body is, as noted above, shifting from the traditional student body of children, adolescents and very young adults to one which includes students of all ages and stages of education. Associated with this change will be the intense competition for jobs by the Baby Boom generation as U.S. economic growth slows down and the rate of new job creation declines. At the same time, the need to use and understand new technologies in the workplace, and the growing automation of industry will accelerate the displacement of workers and the need for re-education and retraining. All of these factors will bring about a reexamination both of the mission of the educational process in American society, and of the ways in which society will fund that process.

- **Institutional Inventions**

Delivery of education is beginning to move off the daytime campus and into new locations and different times. At the same time, segmentation of educational markets is rapidly occurring, as evidenced by computer camps for young and old, and the growing popularity of the Elderhostel movement.

It is increasingly recognized that there is no need to come to the university if the university will come to you. Many universities now conduct courses anddegree-granting programs at locations physically remote from their campuses. These locations include office and industrial facilities, where employees can obtain credit, and occasionally degrees, without ever leaving the workplace. Universities are also conducting evening classes in office buildings and other school facilities closer to desired markets than their campuses.

- Educational Superstars

With new electronic delivery techniques, it is possible to record lectures and demonstrations of outstanding teachers, for delivery to any desired site at any convenient time. For example, any law school in the nation may now present lectures by the distinguished trial lawyer Irving Younger, whose lectures have been videotaped. These delivery media enable the packaging and presentation of outstanding instructors in forms almost as real as life.

Since it is education which provides us both with information about the world and with the criteria to judge that information, the new educational methods will produce a society in which more people are better educated than at any time in our history, or the history of any nation on earth. One of the challenging tasks for the scenario draftsman will be to delineate the nature of education for that society.

Finally, one point rarely addressed in examining the future of higher education is its cost. The scenario draftsman may wish to develop trends on the

rising costs of higher education and ways in which society will deal with those costs. Available data show that for the last quarter century the rate of tuition increases has been rising. Those data are set forth in Table II.

Table I

Average Annual Percent Increase
Tuition and Fees—Four Year Universities[21]

Years	Public	Private
1965-1970	7.5%	7%
1970-1975	7.0	8
1975-1980	7.0	8
1980-1984	10.9	13

Thus, for public four year colleges and universities, annual tuition and fees rose from a 1965 level of $298 to a 1984 level of $1,270, while for private institutions the corresponding increase was from $1,297 to $6,140.

These increases have raised important issues in higher education. For private education, they raised the questions of the survival of the smaller quality four-year private college. For public education, they have posed to legislatures important increases in educational budgets. For both types of institutions, faced with the questions of increasing tuition changes, they have presented to the American public the problems of the affordability of higher education.

Funding higher education in the United States is likely to be one of the major problems facing the institutional planner. The planner has three principal sources from which to fund education. The first and most obvious is tuition, which currently accounts for about 15% of the income at state schools and 46% at most private colleges. Tuition bears the brunt of increased costs because it is the principal source of revenue under the colleges' direct control.[22] The second source is

government, state or federal. Whether state legislatures and the Congress are, in the face of increasing budget deficits, prepared to increase their support for higher education is highly speculative. The third source of potential funding, private philanthropy, is currently under great pressure from a wide variety of such worthwhile enterprises as hospitals, museums, cultural organizations and civic groups. As federal funds recede, the need for private funding correspondingly has grown and is likely to continue to grow. Accordingly, the scenario draftsman will have a variety of cost cases and support variables to consider in dealing with the future of higher education.

The Development of Scenarios

As the foregoing discussion has suggested, a substantial number of issues and factors about the future are available to the scenario draftsman. His problem is less to collect these data than it is to organize them into scenario format which will be useful to the planners for whom the sceanrios are intended. An extensive literature exists which details how business scenarios have been constructed, and it is unlikely that development of scenarios for higher education will be very different.[23] One method described by Amara and Lipinski, two distinguished scenario writers, requires the modeler to follow seven steps:

1. Identify the events and variables important to the planner;
2. Make preliminary forecasts for each variable or event;
3. Select sources best qualified to describe their interrelations;
4. Elicit information about the interrelations;
5. Process the resulting information;
6. Generate alternative forecasts for one or two of the important exogenous variables; and
7. Rerun the model with these forecasts taken as a given to produce the remainder of the forecasts.

The result of the first five steps is one consistent set of forecasts, while the remaining two steps generate alternative scenarios.[24]

Scenarios so generated tend to be largely numerical, filled with the illusory certainty of numbers. But scenarios need not be quantitative. Just as much guidance and information can be provided by scenarios which are principally descriptive and presented in narrative form. A particularly effective example of narrative scenarios, was recently published by workers from SRI International. That work, Seven Tomorrows,[25] provides seven scenarios of the U.S. for the remainder of this century, of which each represents a real possible future, distinct from the others. Examination of Seven Tomorrows will afford the scenario draftsman a view of how scenarios of great power can be developed without resort to computers and large quantities of figures.

In preparing his scenarios for the planners, the draftsman must have a sense of what his audience will be, and how the scenarios are to be used. The purpose of scenarios of the future is not to delineate a single well-defined future against which to plan. Instead, scenarios are useful to prepare planners for the uncertainty which the future presents. Scenarios are effective to show how significant change often coalesces around discrete events, not around the smooth progression of a trend. By examining possible events with potentially serious consequences through the use of alternative scenarios, planners will be better prepared for the future.[26]

Considering alternative scenarios also helps planners recognize the relationships between particular events and trends in the higher education environment, e.g. the need for different delivery systems as the median age of the population rises and new telecommunications equipment becomes available. Amara and Lipinski sum up this application of the scenario method by saying

> The purpose of constructing informative scenarios is to capture the essence of the uncertainty about the future, i.e., the profile of the territory of the future, and to present that information in terms that will be operationally useful. Simply put, operationally useful information is information that we know how to use. We would like to use such informative scenarios to evaluate the consequences of the interaction between scenarios and a candidate strategy.[27]

Because not all planners will be comfortable with the concept of alternative futures, some preparation for their use of multiple scenarios may be required.

Who are these planners to whom reference is so facilely made? In the business environment, planners are increasingly line managers, the managers responsible for planning an organizational strategy and implementing it. In the higher education environment, the planners are likely to be deans and their staffs, responsible for determining the direction and budgeting of their particular schools or colleges. Whether the planners are line managers or deans, however, the better these decision makers are prepared for the complexity, variety and uncertainty of the future, the better will be the quality of their decisions. Alternative scenarios have been shown to be an effective medium for such preparation.

Planning with scenarios has been an established business method for over a decade. According to a recent study of the Fortune 1000 industrial companies by Linneman and Klein, the use of multiple scenarios in planning doubled in the five years between 1977 and 1981.[28] Through the scenario method, corporate managers have been effectively equipped to deal with the turbulence of the contemporary business environment. Indeed, in the conclusion of their paper, Linneman and Klein concluded that multiple scenario analysis "appears to have become the primary

format for depicting corporate environmental assessments for planning purposes."[29]

As this paper suggests, the environment for higher education has already become as uncertain, as complex and as challenging as the business environment. It seems therefore timely for the planner in higher education to consider adopting the tools and methods that have been so useful under similar conditions to the business planner.

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